Guide to grading defects in ponderosa and sugar pine logs

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FOREWORD

This Guide is published by the Pacific Southwest Forest and Range Experiment Station as a contribution from the Western Pine Section, National Log Grade Project, Forest Service. Credit is due, and grateful thanks given, to the many experienced log graders throughout the West who provided much of the information upon which this Guide is based.

GUIDE TO GRADING DEFECTS IN PONDEROSA AND SUGAR PINE LOGS

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1/ Includes cracks and seams

GUIDE TO GRADING DEFECTS IN PONDEROSA AND SUGAR PINE LOGS

This Guide presents the best current knowledge on the identification, definition, and significance of surface imperfections visible on ponderosa[2] and sugar pine logs. It supplements the report on the Improved System for Grading Ponderosa and Sugar Pine Saw Logs in Trees.[3] The only end product used in developing the Improved System (and this Guide) is lumber in the standard grades and sizes defined by the Western Pine Association.[4]

We grade logs to estimate their quality, but we grade them only by what we can see. We do not expect anyone to guess what is inside a log and cannot be seen.

Some characteristics visible on log surfaces provide clues to the usefulness--and thus the value--of the products that can be made from the log; others do not. We expect log graders to distinguish between these various surface characteristics, and to understand their significance and importance.

BASIC DEFINITIONS

Some words used in forestry have more than one meaning, or are rather hazily defined. One word important to log graders is particularly troublesome in this regard: "defect." Forest Terminology defines "defect" as: "Any irregularity or imperfection in a tree, log, piece product, or lumber that reduces the volume of sound wood or lowers its durability, strength, or utility value."[5]

For such a specialized activity as log grading, we must define or limit the word "defect" more precisely. Two classes of defects are recognized in log grading: lumber defects and log defects.

Lumber defects are imperfections or blemishes in lumber which affect its grade classification. Examples include knots, pitch, and stain.

2/ The term "ponderosa pine" as used in this Guide includes both Pinus ponderosa Laws. and Pinus jeffreyi Grev. & Balf.

3/ Gaines, Edward M. Improved system for grading ponderosa and sugar pine saw logs in trees. Pacific SW. Forest & Range Expt. Sta. Tech. Paper 75, 21 pp., illus. 1962.

4/ Western Pine Association. Standard grading rules for lumber. Ed. 1961, rev. to April 1, 1962. 265 pp., Portland, Ore.

5/ Society of American Foresters. Forestry terminology, p. 23, 1958.

Log defects are imperfections or blemishes visible on the surface or end of a log which affect the quantity or quality of the lumber which can be produced from it. The two kinds of log defects are: scaling defects and grading defects.

Scaling defects are imperfections visible on the surface or end of a log which reduce the quantity of sound usable wood it will produce. The volume of the unsound or missing material resulting from a scaling defect is deducted from the gross scale of a log; usually this material is removed from the lumber in the sawmill. Rot and shake are examples of common scaling defects.

Grading defects are imperfections visible on the surface of a log which influence the quality of the lumber that can be sawn from it. Grading defects are important only as predictors of average lumber value; their direct connection with any specific lumber defect is only incidental. Two classes of grading defects are recognized in the Improved System: primary defects and secondary defects.

Primary defects are the log-surface indicators of knots in the underlying lumber: limbs, limb stubs, overgrown limbs, or other indications of where limbs grew. These imperfections are called log knots to distinguish them from the purely lumber term "knot." Log knots, by far the most common log defect, are the major predictors of lowered average lumber value.

Secondary defects are log-surface irregularities which also influence lumber grade output, but not as directly and consistently as do primary defects. They must affect a rather large area of the total log surface before their effect on average lumber value becomes important. Common examples of secondary defects are scars and cankers.

Two other classes of surface characteristics are defined in the Improved System in order to clarify log grading: false defects and indeterminate defects.

False defects are log-surface characteristics which clearly have little or no relation to the average value of the lumber that can be cut from a log. We therefore disregard such defects in grading. Bird pecks, small sound burls, and bumps are common examples of false defects in ponderosa and sugar pine.

Indeterminate defects are log-surface imperfections which may affect lumber value, but for which there are no data that

demonstrate the possible quality relationship. We therefore ignore them in grading. The only items included in this category are sweep and spiral grain.

Certain log defects can be both a scaling defect and a grading defect. Large scars are perhaps the best example; large burls and knot clusters are others in this category. This fact is unimportant in grading, however, because we consider a grading defect in the same way whether or not it requires a deduction in scaling.

Other log-surface characteristics can be both a scaling defect and an indeterminate defect. This also is unimportant to the grader, because we ignore both types of "defect" in grading.

For accurate forestry usage, do not use the word "defect" without a modifying adjective, as for example, "log defect," "grading defect," "false defect," etc.

Another concept important in the proper application of the Improved System for grading is the "panel," which is a unit of the surface of a log that measures 4 feet in length by one-fourth of the circumference in width. It is used as a precise and practical way to define the extent to which grading defects are grouped on the surface of a log; or conversely, the extent to which a log surface is free of grading defects. For a more detailed description of the use and significance of panels, consult the report on the Improved System.

Certain adverbs are used in this Guide to indicate frequency or probability of occurrence. Listed in the order of increasing probability of occurrence, they are: (a) never, (b) rarely, (c) occasionally, (d) sometimes, (e) frequently, (f) usually, and (g) always.

LOG SURFACE IMPERFECTIONS

Log surface imperfections of ponderosa and sugar pine have been grouped alphabetically within four categories--primary defects, secondary defects, false defects, and indeterminate defects--and described individually in this Guide.

Some of the more common direct effects of the various grading defects on the underlying lumber are also mentioned and described. It is important to remember, however, that only the total effectiveness of grading defects as predictors of average lumber value concerns us--not any cause and effect relationship between the individual grading defect and the individual underlying lumber defect.

In general, the descriptions herein apply over the entire range of ponderosa and sugar pine. Any local exceptions known at present are included.

PRIMARY DEFECTS: LOG KNOTS

Definition: A limb, limb-stub, an overgrown limb, or other indication of where a limb grew on a tree stem.

Classification: Primary defect.

Discussion: Only log knots are primary defects. They are the most common grading defect in ponderosa and sugar pine. Among grading defects, log knots are also the most closely correlated with lumber value.

Because log knots are so numerous and important, graders should recognize the different forms they may take, how to measure them, and what to do about special cases.

Log Knot Measurement

In field grading, graders only need to estimate log knot size on relatively few logs. The type of log knot determines the standard to which we measure it.

Bark limbs.--A bark limb is one that is alive, or so recently dead that the bark still adheres. Estimate average diameter inside bark at the log surface, excluding the swelling commonly present at the limb collar. Some limbs on the left side of the tree in figure 1 are alive and some are dead but all are classed as bark limbs.

Bare limbs.--Estimate average diameter of the dead material (fig. 2) at the log surface. Ignore any surrounding callus tissue or circular patterns in the bark.

Knot overgrowth.--When a limb is overgrown, the surface bark pattern expands with tree growth, sometimes reaching more than twice the diameter of the original limb. This expansion does not concern us in grading, because we grade only on what we can see, i.e., the bark pattern. Estimate average diameter to the outer edges of the main circular overgrowth pattern, ignoring any extremes in bark patterns.

On fast-growing trees, determination of the "main pattern" diameter can be difficult. The overgrowth in figure 3, for example, measures over 4 inches across the bark pattern extremes, but the main pattern is only about 3 inches in diameter. This primary defect is properly classed as a 3-inch overgrown log knot; the size of the original limb (probably less than $1\frac{1}{2}$ inches) is immaterial.

On slow-growing trees, measurement of overgrown log knots is easier, as shown in figure 4.

Figure 1.--The branches on the left side of this tree are classed as bark limbs.

Figure 2.--All of these limb stubs (bare limbs) and limb overgrowths are primary defects.

Figure 3.--This primary defect is classed as a 3-inch overgrown log knot.

Figure 4.--This primary defect is classed as a 1-inch overgrown log knot.

Limb Stubs Carried Out in the Bark

Many ponderosa and sugar pines have small, dead limb stubs protruding from the bark of the lower logs. Some stubs extend continuously through the wood to the point of origin, as any normal limb. Others have been separated, with part encased in the wood, and part carried out loosely in the bark (fig. 5). These stubs can frequently be pulled out, leaving a hole which is confined to the bark (fig. 6). Clear wood is sometimes produced between the two parts of this latter type of limb.

We count and measure limbs carried out in the bark exactly the same as we do other log knots. To repeat, it is the influence of grading defects on average lumber value, as established by diagram analysis, which makes them important in log grading--not the directness of their connection with specific lumber defects. Any local variation in the degree of their influence on average lumber value is accounted for in local mill studies.

Log Knots in Scars and Cankers

Log knots are occasionally visible on the exposed wood surface of scars and cankers. They present a special problem of classification. Whether or not we count such log knots depends on whether they would have been visible if the damage which caused the scar had not occurred.

The following rules have been established to provide a standard answer to this problem:

1. Count a log knot in a scar or canker as a primary defect if it exceeds 2 inches in diameter. In ponderosa and sugar pine, limbs larger than 2 inches rarely become overgrown; such large limbs would therefore have been visible on the log surface if the scar or canker did not exist.

2. Count a log knot in a scar or canker as a primary defect if the end of the knot is less than 5 inches below the projected normal wood surface. Since about 5 inches of wood must be laid down over a ponderosa and sugar pine limb stub before all surface indications of it disappear, traces of one buried less than 5 inches deep would have been visible on the undisturbed log surface.

3. Ignore a log knot which is 2 inches or smaller in diameter, and buried 5 inches or deeper in a scar or canker. In such a case, the scar or canker still counts as a secondary defect at that point.

Figure 5.--This 5/16-inch limb stub was carried out loosely in the bark of a 27-inch ponderosa pine.

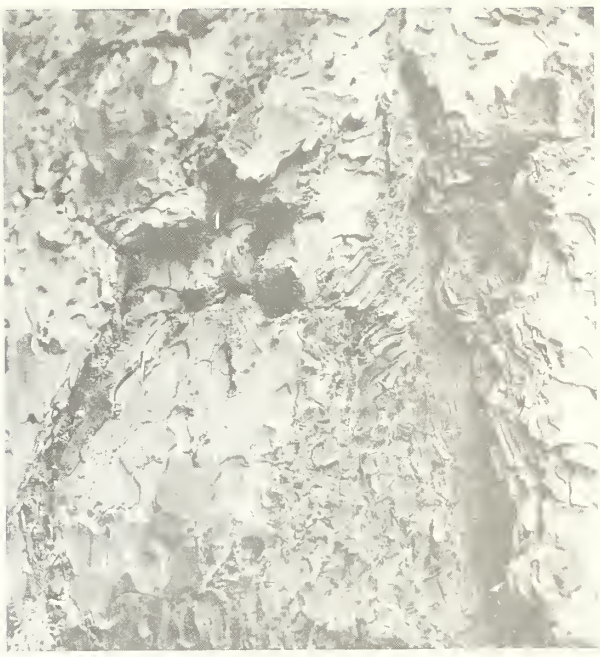

Figure 6.--Same view as figure 5, with limb stub removed. This irregularity must be counted as a primary defect.

If a log knot in a scar is countable as a primary defect, classify any panel which contains it as a primary defect-containing panel (fig. 8); ignore any portion of the scar (a secondary defect) falling in the same panel. If none of the log knots in a scar is countable, consider the entire scar as a secondary defect (fig. 7).

Special Cases: Conks and Limb Holes

Certain other log-surface imperfections indicate where a limb has been. These are conks and limb holes. Graders must recognize and count them as log knots.

A conk is a mushy, leathery, or corky protrusion of definite form and structure on a tree bole. It is the external evidence (or fruiting body) of a wood-destroying fungus, and signifies rot and decay of some type within the tree.

Most fungi attacking ponderosa and sugar pine enter through exposed heartwood, usually in broken-off or dead branches. Thus, a conk usually marks the spot where a limb was located, even if the limb is no longer visible, and so must be counted as a primary defect.

Occasionally, a conk will appear on a scar or an exposed root where entry was obviously not gained through a branch. We ignore such conks in grading, except as they may affect the merchantability of a log. Carefully scrutinize any conk-bearing log to make sure its net scale is one-third or more of gross scale.

A limb hole is an opening which penetrates through the bark into the wood of a tree. It marks the location of a limb that has broken or rotted out naturally, or has been excavated by birds or animals (fig. 9). Limb holes are properly considered as external signs of log knots (where a limb has been), and therefore primary defects.

Figure 7.--The single 1-inch log knot (pencil) on this scar is 16 inches below the normal log surface (hand). No trace of it would have been visible had the damage not occurred, and it can be disregarded in grading. The entire scar is therefore classed as a secondary defect.

Figure 8.--The 1-inch log knots on this scar, 3 inches below the normal log surface, would have been visible had the damage not occurred. They count, therefore, as primary defects.

Figure 9.--This 3-inch diameter hole resulted when birds or animals excavated a rotten limb. It is a primary defect.

SECONDARY DEFECTS

Secondary defects include all other grading defects. They generally must affect a rather large area of a log's surface before average value is significantly affected. This provision is reflected in the liberal allowances permitted in the Improved System specifications for this type of grading defect. For example, Grade 1 in the Improved System admits secondary defects of such size and/or number that three panels are required to contain them. Individual small secondary defects, therefore, rarely influence the grade of a log. Even so, all must be counted in grading.

Large Sound Burl

Definition: A hard, woody protuberance on a log surface, covered with bark, with no evidence of pitch flow (fig. 10). A large sound burl covers more than one-fourth of the log circumference, is round or elliptical, and has no protruding limbs or evidence thereof. Sound burls covering one-fourth or less of log circumference are classed as false defects, and are described elsewhere.

Classification: Secondary defect.

Significance: The cause of burls in ponderosa and sugar pine is presently unknown. The wood underlying a burl is usually distorted into a wavy, curly figured pattern (fig. 11), and characterized by pitch spots, pitch streaks, and an abnormal degree of hardness. These factors, and the associated distorted grain and changes in grain-slope, may result in surfacing problems, warp, and breakage in the lumber, thus affecting value. The larger the burl, the greater its influence on average lumber value; hence the size requirement (larger than one-fourth log circumference) before a burl is considered degrading.

In determining how much of the log circumference is covered, measure a burl at the point of its attachment to the log. The burl on the 20-inch diameter ponderosa pine in figure 12 is 38 inches across at its widest point, but covers only 22 inches of circumference at the point of attachment to the tree. Since one-fourth circumference at this point is about 16 inches, the burl is properly classed as a secondary defect, and can be contained in two panels.

One type of large knot cluster (fig. 13) resembles a burl. The two can be easily differentiated by the presence of log knots on the cluster. These log knots are primary defects, and so the growth is not called a burl.

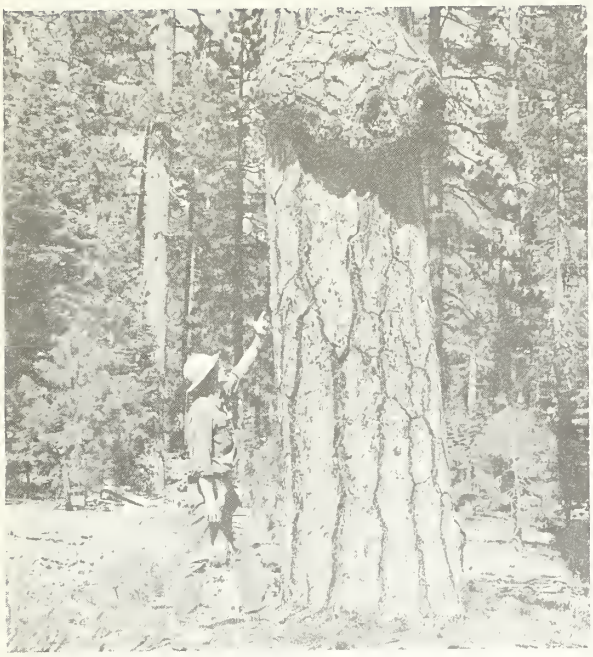

Figure 10.—This large burl is a secondary defect, because it covers more than one-fourth of the log circumference.

Figure 11.—Distorted grain and massed pitch, shown here where a large burl was cut off, adversely affect average lumber value.

Figure 12.--When measured at the point of attachment, this large burl can be contained in two surface panels. It is a secondary defect.

Figure 13.—The log knots on this burl-like growth identify it as a knot cluster, and therefore a primary defect.

Unsound Burl

Definition: Has the same general shape as a normal burl, but is partially dead (figs. 15 and 16), or shows evidence of heavy surface pitch flow (fig. 14).

Classification: Secondary defect, regardless of size.

Significance: The wood underlying an unsound burl is likely to have massed pitch, insect work, and interior rot (fig. 16), in addition to the lumber defects characteristic of sound burls. Thus the influence of unsound burls on average lumber value is usually greater than that of sound burls. Therefore, count all unsound burls regardless of size as secondary defects.

It is still necessary, of course, to determine how much of the log surface an unsound burl covers. Details of measurement are the same as for sound burls. The unsound burl in figure 17, for example, can be contained in one panel; those in figures 14, 15, and 16 each require two panels to contain the burl.

Some confusion may arise in distinguishing between unsound burls of the type shown in figure 14 and sound burls; and between this type of unsound burl and certain cankers. In the first case, heavy surface pitch flow clearly distinguishes the unsound burl in figure 14 from the typical sound burl in figure 10. (Ignore superficial pitch from a wound or fresh insect attack.) In the second case, the typical burl shape in figure 14 serves to distinguish it from the type of heavily-pitched canker shown in figure 20.

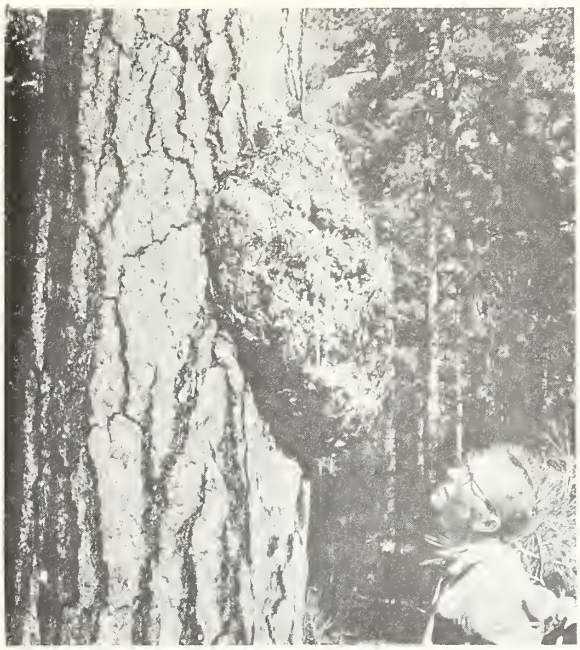

Figure 14.--The heavy surface pitch flow indicates that this burl has become unsound. It is therefore a secondary defect, regardless of size.

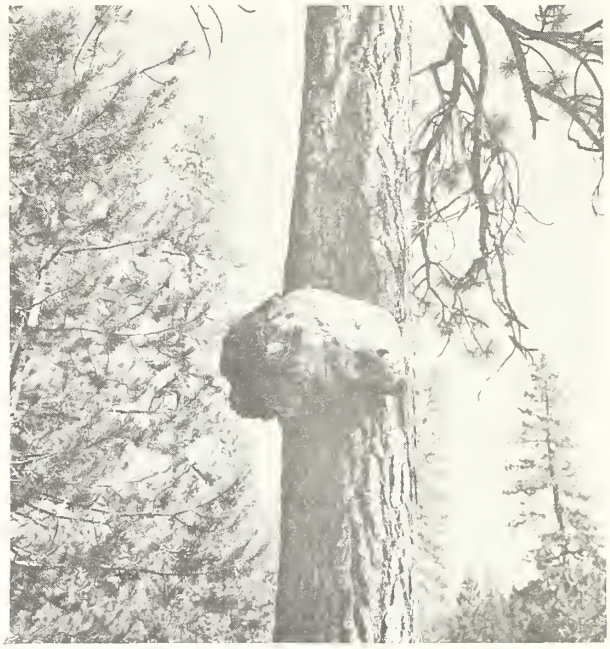

Figure 15.--Part of this burl is dead, and shows increasing insect work. This indicates a greater influence on average lumber value than if the entire burl were live and sound. This is a secondary defect.

Figure 16.--An unsound burl partially sawn out to show rot and insect work--a secondary defect. These, and other unsound burl characteristics, have an adverse effect on average lumber value.

Figure 17.--This burl is less than one-fourth of log circumference in size. But it is classed as a secondary defect because it is unsound.

Canker

Definition: A definite, relatively localized lesion, characterized in ponderosa and sugar pine by destruction or distortion of tissue, callus formation, and pitch flow in varying amounts. The most common types of cankers are caused by stem infections of dwarf-mistletoe and various rusts (fig. 18). Others are associated with various rot-producing fungi.

Classification: Secondary defect.

Significance: Stem cankers due to mistletoe or rusts are variable in form and shape. They can usually be recognized by the heavy pitch accumulations and by a roughened or irregular surface. Sometimes they have a concave or "scooped-out" appearance. A large limb is frequently prominent in these cankers (fig. 18), representing the point at which the stem became infected.

One easily recognized canker found on ponderosa pine in certain parts of its range is caused by a rust of the genus Peridermium. These cankers resemble "mouths" or "kinks" in the bole (fig. 19), and frequently affect 1/2 to more than 3/4 of the circumference of a log.

Other types of cankers (fig. 20) are less easily characterized. Some are of fungus origin, and others may be caused by frost, sun scald, or other wounds. But once an open lesion is produced, disease organisms often attack, and the typical pattern of tissue destruction and callus formation develops.

Bumps (fig. 41), which are false defects, should be clearly differentiated from the early stages of some cankers (fig. 21). The key points in making this distinction are the distinct break in the bark, the evidence of pitch flow in varying amounts, and the dead material and/or callus tissue characteristic of cankers.

Probable reasons for the influence of cankers on average lumber value are the associated pitch, either massed, streaked, or in pockets; stain; rot; and distorted grain, which may result in warp and in surfacing degrade.

Log knots are often found within or near cankers (figs. 18 and 19). Any panels we "block-out" in grading which contain such log knots are classed as primary; the portions of the canker (a secondary defect) included in the same panels are disregarded, since primary defects take precedence. In figure 19, for example, the primary defect panels include the entire canker, so that no secondary defect-containing panels are counted. Any portions of the canker "left-over" after the primary defect-containing panels are blocked-out to best advantage must be included in secondary defect panels.

Disregard small log knots showing in a deep canker, following the guidelines in the section on log knots in scars and cankers. When determining the edges of a canker, count all the dead, distorted, and calloused tissue as part of the canker.

Figure 18.--This canker was probably caused by rust, or by dwarfmistletoe. The log knots it contains are primary defects; the rest of the canker is a secondary defect.

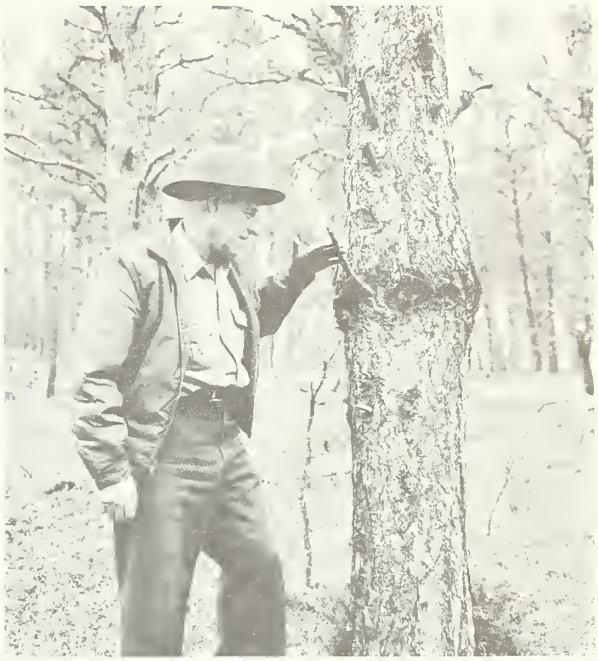

Figure 19.--A peridermium canker, by itself, is a secondary defect. But on this tree, the many log knots take precedence in all the panels in which the canker could be placed.

Figure 20.--The open nature of this blemish and the visible evidence of heavy pitch flow identify it as a canker, and thus a secondary defect.

Figure 21.--This small blemish is an early stage of a canker, a secondary defect. Note the distinct break in the bark surface, edged with large globules of pitch.

Crook

Definition: An abrupt bend in a log or tree due to damage from wind, snow, a falling limb or tree, or other mechanical cause. One common result of such damage is the loss of the leader (fig. 22); another is the breaking off of a fork (fig. 23). In either case, a new leader develops and a crook results.

Classification: Secondary defect.

Significance: When a crooked log is sawn, its knotty core shows up quicker and affects more boards than in straight logs. The lumber is also likely to contain compression wood and radical changes in grain-slope, both leading to warp and surfacing problems. Average lumber value is lowered.

We measure the extent of a crook by the distorted stem surface area associated with it. Defect-free panels must exclude any distorted stem surface areas; defect-containing panels must include all distorted stem surface areas. Direction changes in the bark fissures are the most useful signs of these areas (figs. 23 and 24).

Graders should recognize that in cases of severe crook the distorted stem surface area will usually extend completely around the log. A severe lower-log crook (fig. 25) would therefore exclude an otherwise defect-free log from grade 1, because at least four secondary defect-containing panels are affected. But upper-log crooks (fig. 22) rarely have much influence on grade, because enough log knots are usually present to "fix" the grade of the log without reference to secondary defects.

The Improved System specifications state that "grades are to be applied to 16-foot log lengths as cruised in standing trees." This requirement means that graders must consider crooks in whatever 16-foot log they happen to fall, regardless of how the tree may eventually be bucked.

Figure 22.—The crooks visible in the center tree resulted when the leader was killed. They are secondary defects.

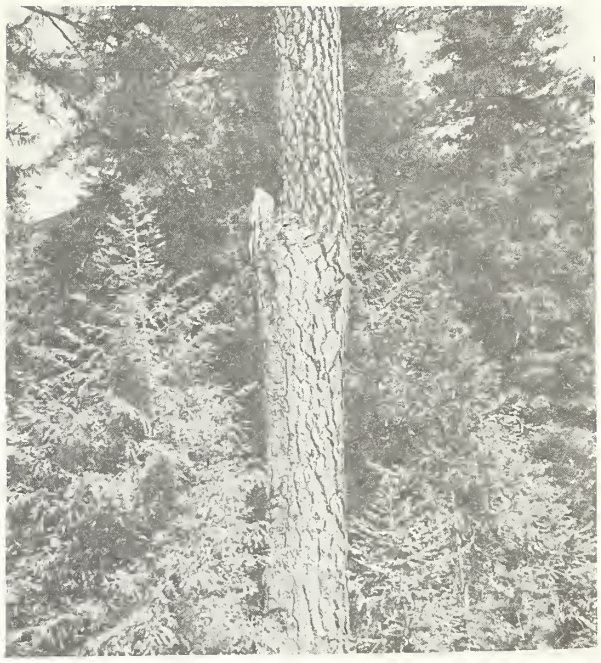

Figure 23.—The extent of this crook (a secondary defect), is defined by the distorted stem surface area associated with it.

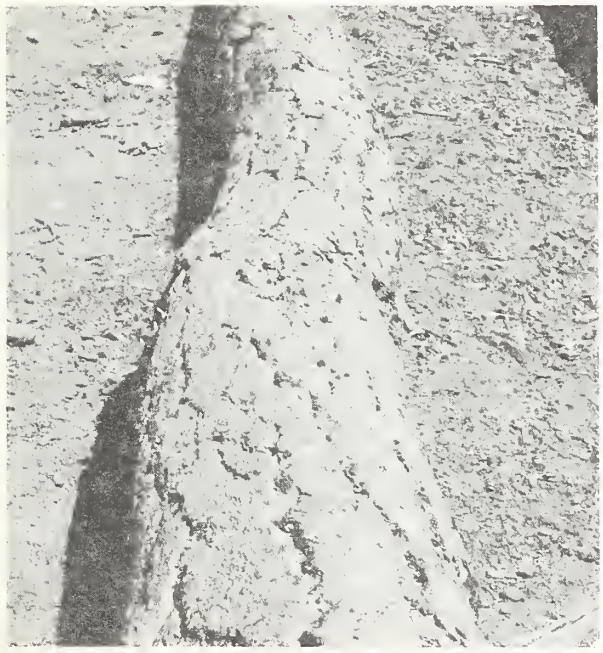

Figure 24.—Direction changes in the bark fissures help the grader recognize the area of distorted stem surface area on this crooked log.

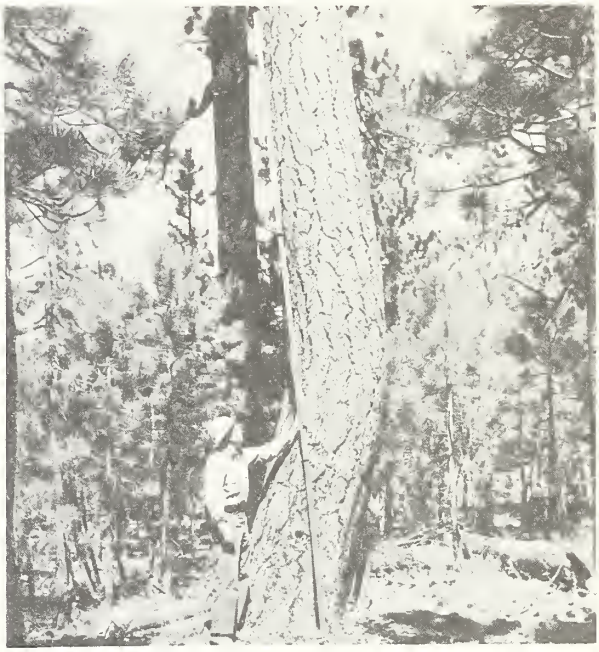

Figure 25.—Four panels are required to contain the distorted stem surface area of this crook (secondary defect). The log cannot be grade 1 even if otherwise free of grading defects.

Fork

Definition: A point in a tree where the trunk divides into two leaders or stems (fig. 26). A fork can occur at any point on a tree bole, but is more common in the upper logs.

Classification: Secondary defect.

Significance: A fork is similar to a crook in its effect on average lumber value. Its extent is also determined by the distorted stem surface area associated with it.

Graders should recognize that the distorted area of a fork sometimes will extend completely around the log (fig. 27). The distorted stem surface area on the flat sides of forks is easy to delineate by the "seam" extending downward from the crotch (figs. 28 and 29). On the other two sides, the distorted stem surface area is usually not as extensive; the shape of the fork, the amount of deviation of the two stems from the axis of the main tree bole, and the bark pattern can be used to estimate the area of distortion.

Forks usually occur high in a tree where numerous log knots are also present. In such cases, the forks do not influence log grade, because the log knots take precedence. This is also true of most lower-log forks in younger trees (figs. 27 and 28), in which enough log knots are usually present to "fix" log grade without reference to any secondary defects. But on a relatively clear log (fig. 29), a fork may be a major factor in determining grade.

We grade 16-foot logs "as cruised," following regional or local cruising instructions. Forks must be counted wherever they occur, regardless of how the tree may eventually be bucked.

Figure 26.--Enough log knots are present in the log containing this typical fork to "fix" grade, without reference to the fork, a secondary defect.

Figure 27.--The distorted stem surface area associated with this "U-shaped" fork extends completely around the tree.

Figure 28.--We grade logs "as cruised." Follow regional or local cruising instructions to identify the first log to be graded in trees like this.

Figure 29.--Distorted grain, massed pitch, and included bark, shown here where a log was bucked through a fork, adversely affect average lumber value. The fork is a secondary defect.

Scar

Definition: An opening in the bark of a tree which exposes underlying wood. The term "scar" is also used here to include cracks, seams, and evidence of old wounds which have been partially or completely covered over by callus tissue during the healing process (fig. 30). Common causes are fire (figs. 30 and 32), lightning (figs. 33 and 39), falling trees or limbs, porcupines and other animals, and past logging damage (fig. 31).

Classification: Secondary defect, regardless of size.

Significance: Scars are the most common secondary defects in ponderosa and sugar pine. They usually affect lumber value indirectly; that is, their degrading effect is likely to be from associated blue stain, weather check, pitch, rot, bird-work, or insect holes (fig. 31).

Small scars are easy to measure, and to include within panels or to exclude from panels, as the case may be. Measuring large scars, particularly those extending to the tree base, can be more difficult.

Graders should keep two important considerations in mind when measuring large basal scars:

1. Begin measurement at stump height. Ignore portions of any scar lying below standard stump height.

2. Panel width equals one-fourth of log circumference at the point of occurrence of the grading defect.

Large basal scars (fig. 32) often are wider than one-fourth of circumference at stump height. When this occurs, two or more panels are required to contain the scar at that point, even though the upper portions of the scar can be confined to one panel width. The scar in figure 32, for example, is only 7 feet tall and less than one panel width across in its upper portions. Because the scar is wider than one-fourth circumference at stump height, three panels are required to contain it: two panels for the lower portions and one for the upper.

Height and width measurements of all scars must include the "callus roll" or "bark roll" which forms around older scars as they gradually grow over.

Scars from current-season injuries present a special problem. The wood underlying most such scars has not yet had time to become degraded at the time of grading.[6/] If the logs containing these scars will be used before any degrading occurs, ignore the scars in grading. On the other hand, if enough time will elapse for the underlying wood to become degraded before the logs will be used, count the scars as secondary defects. Specific regional or local instructions may be issued to guide the grader in these cases.

6/ Fresh scars which cause the wood to split or crack such as those caused by lightning or frost, may be degrading immediately as they occur. Regional or local instructions may be issued to cover this point.

Figure 30.--Partly-healed fire scar, 10 feet tall. This secondary defect requires three panels to contain.

Figure 31.--Logging road construction scar. Note the insect holes in the exposed wood, and the evidence of rot at the bottom of the scar.

Figure 32.--This 7-foot high fire scar covers more than one-fourth circumference at stump height, but narrows to less than one panel width 4 feet above the stump. A total of three panels is therefore needed to contain this secondary defect.

Figure 33.--Regional or local instructions may instruct the grader whether or not to count this fresh lightning scar as a secondary defect.

FALSE DEFECTS

Like grading defects, false defects are found on the surface of logs. Unlike the former, however, they usually have little or no effect on average lumber value, and are disregarded in grading. Since some false defects bear a passing resemblance to certain grading defects, it is important that graders are certain an irregularity actually is a false defect before they disregard it. This calls for accurate identification.

Bark Distortion

Definition: A definite break or alteration in the normal pattern of the bark which cannot be clearly related to any of the recognized grading defects.

Classification: False defect.

Significance: Bark distortions are usually either superficial or related to imperfections too deeply buried in the log to influence average lumber value.

In ponderosa and sugar pine, most breaks and alterations in normal bark patterns can be related to a grading defect, such as a log knot (fig. 34, arrow) or a small scar. Those surface irregularities whose cause the grader is unable to identify are properly called bark distortions (figs. 35 and 36).

Graders must not classify a surface blemish as a "bark distortion" merely because it does not fit the usual or "classic" appearance of a particular commonly-recognized defect. If the rather unusual overgrowth shown in figure 34 was called a bark distortion because it did not appear the same as common log knot overgrowths (figs. 3 and 4, page 5), the log could be graded higher than its true value. Restrict "bark distortion" only to imperfections not falling in any other category.

Figure 34.--One-half inch overgrown log knot (arrow). The usual circular overgrowth bark pattern is only slightly in evidence, but the two vertical creases in the bark signal the location of this primary defect. This is not a bark distortion.

Figure 35.--This break in the normal bark pattern (circled) is elevated about one-half inch above the log surface. It is a bark distortion, and a false defect.

Figure 36.--The abnormal bark pattern (circled) on this tree does not resemble any recognized grading defect. Therefore it is classed as a bark distortion and a false defect.

Bird Holes

Definition: Openings or holes in a tree, caused by two main types of birds: woodpeckers and sapsuckers. The holes are usually less than 1 inch in diameter and confined to the bark. Only rarely do they exceed this size or penetrate the wood.

Classification: False defect.

Significance: Woodpecker activity in ponderosa and sugar pine is normally confined to the bark of the butt log. The birds search for bark beetles and other insects which work only in the bark (fig. 37). They also excavate storage places for food (fig. 38). Their holes do not affect the wood of the tree, and so we disregard them in grading.

Heavy woodpecker drilling is sometimes found in conjunction with large scars (fig. 39) on which the birds have searched or excavated for insects. Such bird activity is not counted separately; instead, it is merely considered part of the scar, which is a secondary defect.

The small holes (commonly called bird-peck) made by sapsuckers and other small sap-eating birds are usually confined to the bark, although they occasionally penetrate the wood slightly. Sometimes the holes are found singly or in small clusters; more commonly, they are found in horizontal bands or rows. An occasional log is freckled with them (fig. 40). Bird-pecks may cause small grain distortions or birds-eyes, or (rarely) dark stained spots in the wood. Their effect on average lumber value is negligible, however, and bird-peck is classed as a false defect.

Figure 37.--Woodpeckers in search of bark beetles made these holes. They are confined to the bark and do not affect the wood; they are false defects.

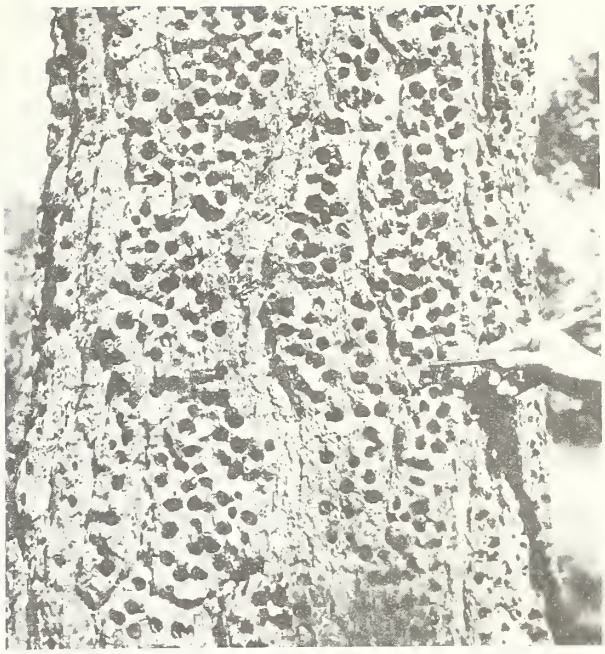

Figure 38.--The woodpecker holes in the bark of this healthy tree were made to provide storage places for food. They do not affect log value, and are false defects.

Figure 39.--The bird holes on this old lightning scar are not counted separately, but are considered only as part of the scar, which is a secondary defect.

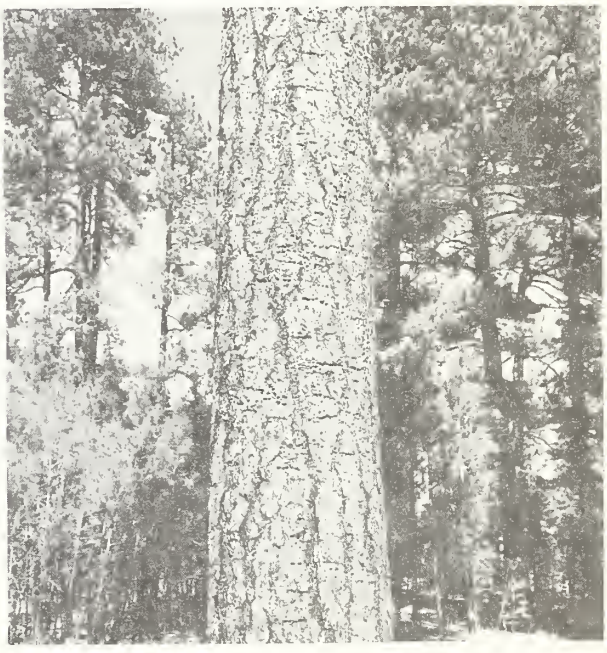

Figure 40.--Sapsucker work. Note the typical horizontal bands or rows. All these holes are false defects.

Bumps

Definition: Small bark-covered swellings on a log surface (fig. 41). Sometimes the bark is slightly open or fissured, and exuding a little superficial pitch. Some bumps bear a passing resemblance to log knot overgrowths or small cankers, but in most cases they can be readily differentiated from these grading defects.

Classification: False defect.

Significance: Bumps occur throughout the ranges of ponderosa and sugar pine, being quite common in some areas and rare in others. Their cause is unknown. When sawn, most bumps disappear with the slab. Others may cause a slight swirl in the grain of the first several boards. In any event, they have no significant effect on average lumber value, and are thus false defects.

Bumps should be accurately distinguished from the two grading defects which they sometimes resemble slightly: log knot overgrowths, and cankers. Bumps do not produce the circular bark pattern typical of log knot overgrowths (fig. 3). Usually they protrude noticeably from the log surface (figs. 41, 42, 43), whereas overgrowths in pine normally do not.

Cankers are distinguished from bumps by their pitch flow and dead material (figs. 20 and 21). Also, bumps are usually smaller than cankers.

Some bumps may resemble very small burls. It is not important to distinguish between these two kinds of false defects, because the effects of both on average lumber value are judged to be nil. The blemish shown in figure 43, for example, might be either a bump or a small burl.

Graders may find an occasional tree bearing what appear to be numerous bumps extending up the trunk to near the live crown (fig.44). On closer examination, the upper blemishes near the live crown will show traces of a limb in their centers. This means that the lower "bumps" almost certainly are also log knots, but in a more advanced stage of being overgrown. In this rare case, then, all the blemishes are counted as primary defects.

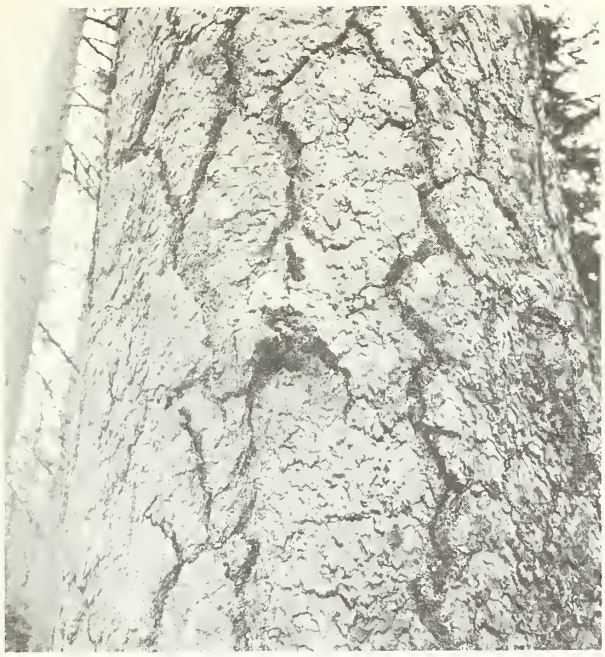

Figure 41.--This slightly open bump, exuding a little superficial pitch, is considered a false defect.

Figure 42.--This swelling, not open or showing any pitch, is classed as a bump, a false defect.

Figure 43.--Bump or very small burl, a false defect. Whatever the exact classification, this blemish will probably disappear with the slab.

Figure 44.--Tree in the center appears to bear numerous bumps. But the upper blemishes clearly are abnormal log knot overgrowths. All the "bumps" on this tree must therefore be counted as primary defects.

Small Sound Burl

Definition: A hard, woody, bark-covered protuberance on a log surface, with no evidence of pitch flow (figs. 45, 46, and 47). A small sound burl covers one-fourth or less of the log circumference, measured at the point of attachment to the log, is round or elliptical, and has no protruding limbs or evidence thereof.

Classification: False defect.

Significance: Pitch and distorted grain are sometimes found in lumber cut from logs bearing small burls, but not in sufficient amounts to have a significant influence on average lumber value (fig. 47). For this reason, they are classed as false defects.

Some logs bear more than one small burl (fig. 48). This is immaterial in grading, because we have no evidence of any "cumulative" effect of burls on average lumber value. Whether 1 small burl or 20 are present on a log, all are false defects.

Some very small burls may be easily confused with certain kinds of bumps, another class of false defect. The blemishes illustrated in figure 48, for example, could be either. But an exact distinction is not important because the effects of both on average lumber value are judged to be the same.

Large burls and unsound burls are both classed as secondary defects, and are described elsewhere.

Figure 45.--This burl measures 8 by 12 inches, and was located 18 feet up on a 28-inch d.b.h. ponderosa pine. Since it covers less than one-fourth of the log circumference, it is a small burl, a false defect.

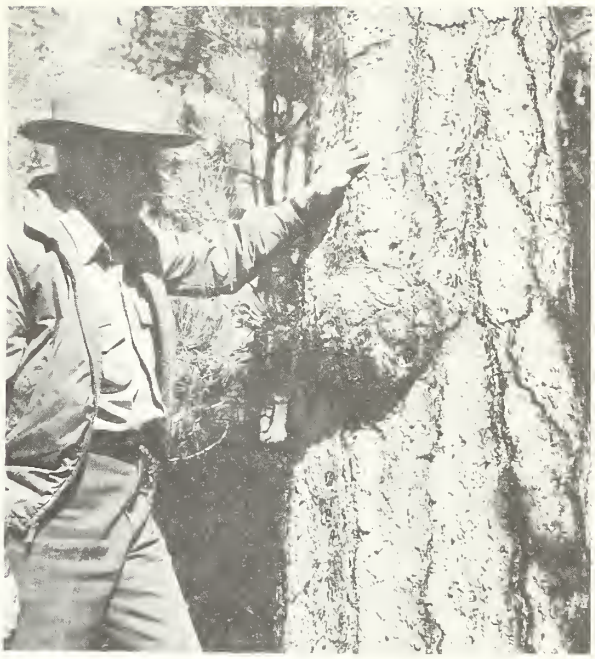

Figure 46.--The shape, size, and intact bark helped in classifying this surface irregularity as a small, sound burl, a false defect.

Figure 47.--This small, sound burl, a false defect, will not significantly affect the average value of the lumber cut from the log containing it.

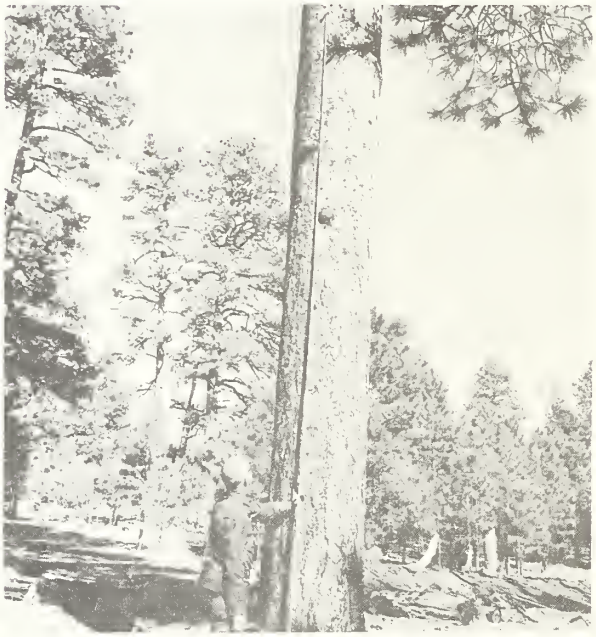

Figure 48.--These blemishes may be either small burls or bumps. Exact classification is not important, because both kinds are false defects.

Flanges and Flutes

Definition: A flange is a protruding buttress-like structure at the base of a tree, extending outward beyond normal butt- or stump-flare. A flute is a depression or fold, running up and down the surface of a tree, but generally confined to the butt log.

Classification: False defects.

Significance: Flanges and flutes are not very common or important in ponderosa and sugar pine. Both appear to be related to site conditions and to the mechanical stresses which have affected the tree. They sometimes occur together in the same log (fig. 49). Both are easily confused with the abnormal callus growths sometimes formed around the edges of large scars (fig. 50).

The wood in flanges is outside the portion of a log that can be used for lumber, even by taper sawing. Flanges are not associated with any lumber defects and do not have any effect on average lumber value.

Flutes are usually superficial (fig. 51), and are not associated with any lumber defects. They are false defects because they have no effect on value.

Figure 49.--This log has a flute (depression) at the middle right and a flange (protrusion) at the upper left. Neither have any significant effect on average lumber value, and so are false defects.

Figure 50.--The buttress-like abnormal callus formations at the lower left of this scar resemble flanges. True flanges, however, are not associated with scars.

Figure 51.--The vertical depression above the burl is a flute. Flutes do not affect average value, and are false defects.

Insect Holes

Definition: Small openings (usually less than one-half inch in diameter) made in the bark and the wood by the adult or larval stages of a variety of insects.

Classification: Can be considered false defects; insect holes in the exposed wood of scars, cankers, or unsound burls are considered only part of the secondary defect on which they occur.

Significance: The holes made by beetles penetrating the bark of ponderosa and sugar pine are usually obscured by blobs or cylinders of pitch, called pitch tubes (figs. 52 and 53). These tubes are the most obvious surface evidence of bark beetle attack. Unless the beetles succeed in killing a tree, their holes do not affect average lumber value, and we disregard them in grading.

A tree killed by beetles should be recorded as "dead." (Dead trees are graded only under special circumstances, using special instructions and procedures.)

Wood borers and ants often attack the exposed wood of such secondary defects as scars (figs. 54 and 55), cankers, and unsound burls (fig. 16). Their presence is evidenced by holes in the wood, and by the associated boring sawdust. These holes contribute to the lower lumber values associated with such grading defects, and are counted only as part of the secondary defect.

Figure 52.--Fresh bark beetle pitch tubes. Insect holes do not affect the wood, and are false defects.

Figure 53.--Pitch tubes are the surface evidence of bark beetle attack. Ignore these holes in grading live trees.

Figure 54.--Insect work contributes to the lumber degrade associated with this old scar, a secondary defect.

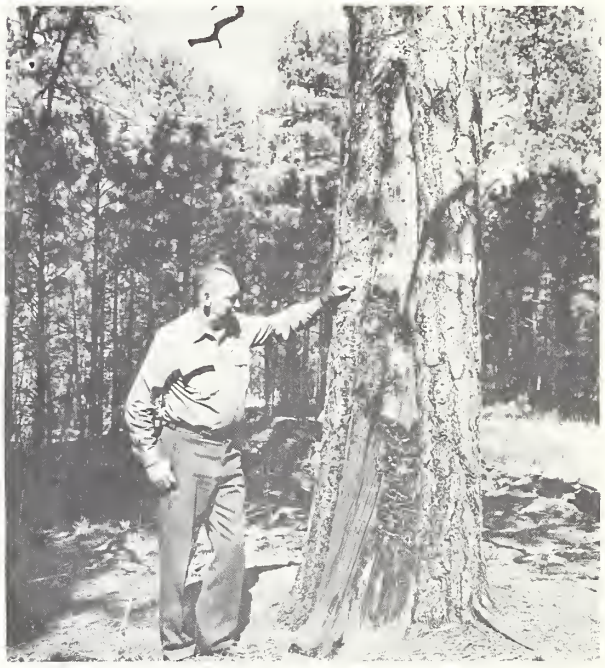

Figure 55.--The insect holes in this fire scar are not counted separately. Instead, they are considered part of the scar, a secondary defect.

INDETERMINATE DEFECTS

This classification includes certain characteristics which may affect lumber quality, but for which there are no data that demonstrate the possible quality relationship. It includes sweep and spiral grain. Performance studies are assumed to contain an unbiased sample of logs with these characteristics, thus accounting for their relationship to average lumber value in the performance tables.

Spiral Grain

Definition: A form of cross grain in which the fibers extend spirally about, rather than vertically along, the tree bole.

Classification: Indeterminate defect.

Significance: Little factual information is available on the recognition of spiral grain in standing ponderosa and sugar pines, or on its effect on average lumber value. Thus we cannot evaluate its importance in log grading, and must therefore class spiral grain as an indeterminate defect and disregard it in grading.

Sweep

Definition: A gradual bend in a log or tree. Sweep originates when a tree is bent or pushed partly over, or leans away from competing vegetation and towards the light. It develops as the tree leader gradually grows back to a vertical position.

Classification: Indeterminate defect.

Significance: We do not have factual information on the effect of sweep on average lumber value. Because of this, we cannot now evaluate its importance in log grading. Sweep is therefore classed as an indeterminate defect, and ignored in grading.

GPO 966172

Jackson, Willard L.

1962. Guide to grading defects in ponderosa and sugar pine logs.
U.S. Forest Serv. Pacific SW. Forest & Range Expt. Sta. 34 pp., illus.

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